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# A New Species of *Hechtia* (Bromeliaceae) from Chihuahua, Mexico

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**ABSTRACT.** *Hechtia edulis* I. Ramírez, Espejo & López-Ferr. (Bromeliaceae) is described and illustrated from Copper Canyon National Park, Chihuahua, Mexico. The new entity is characterized by its caespitose, monocarpic habit, by its small rosettes, and by the similarity of its staminate and pistillate inflorescences in size, the simple panicles with the branching much shortened, the flowers sessile, the floral bracts scarious, and pistillate flowers with petals green and carnose.

**RESUMEN.** Se describe e ilustra *Hechtia edulis* I. Ramírez, Espejo & López-Ferr. (Bromeliaceae) del Parque Nacional Barranca del Cobre, Chihuahua, México. Esta nueva entidad se caracteriza por su hábito cespitoso, rosetas monocárpicas, de tamaño pequeño y por la similitud de sus inflorescencias estaminadas y pistiladas, panículas simples con ramas muy cortas, flores sésiles, brácteas florales escariosas y flores pistiladas con pétalos verdes y carnosos.

**Key words:** Bromeliaceae, Chihuahua, *Hechtia*, IUCN Red List, Mexico.

The genus *Hechtia* Klotzsch (Bromeliaceae) comprises ca. 60 species distributed from southern Texas (U.S.A.) to northern Nicaragua. Approximately 56 species are endemic to Mexico, and only four species range outside this country. Thus, this is the one genus within the Bromeliaceae with the most endemism in Mexico (ca. 94%; Espejo-Serna et al., 2004). All the described species are dioecious, with the exception of *H. gayorum* L. W. Lenz, which is a polygamomonocious species from Baja California. Plants of *Hechtia* are terrestrial, growing mostly as lithophytes on calcareous, volcanic, or chalky soils.

Understanding the species limits in *Hechtia* has been difficult because most of the species are known only from one sex and more commonly from fruiting specimens, probably because the flowering intervals

are usually extremely short, less than two weeks. Moreover, sexual dimorphism is very common among species in the genus, with the inflorescence size and ranking, as well as the flower texture and color, quite variable between staminate and pistillate individuals of the same species. Several species, such as *H. stenopetala* Klotzsch and *H. schottii* Baker, show larger inflorescences, with more numerous and fragrant flowers on staminate specimens when compared with pistillate ones that tend to present more pauciflorous, shorter inflorescence with flowers that are odorless. In only a few instances are the dioecious taxa similar in measurements for staminate and pistillate inflorescences (i.e., *H. rosea* E. Morren ex Baker). The new species described herein is remarkable for this similarity.

*Hechtia* has traditionally been considered within the bromelid subfamily Pitcairnioideae, although recent phylogenetic analyses based on molecular markers have challenged this hypothesis. While several phylogenetic analyses support the monophyly of the genus (Duvall et al., 1993; Horres et al., 2000; Reinert et al., 2003; Givnish et al., 2004), the broader relationships of *Hechtia* with other genera within the family are uncertain (Givnish et al., 2007). In analyses, *Hechtia* has appeared in a basal position (Reinert et al., 2003), outside the Pitcairnioideae s. str., as the sister group of Tillandsioideae (Horres et al., 2000; Crayn et al., 2004). More recently, the genus has been supported as its own subfamily, as the Hechtioideae (Givnish et al., 2007). Internal relationships within the genus have not been approached in any of the published phylogenetic analyses to date, and there is far from a satisfactory understanding of its relationships.

A monograph of the entire genus *Hechtia* is ongoing, and as a result extensive fieldwork has been carried out for several years to clarify species numbers and limits. Preliminary studies suggest a suite of informative characters to delimit taxa within

the genus, using vegetative as well as floral features. These include monocarpic (with terminal inflorescence) versus polycarpic (with lateral inflorescences) rosettes, sessile versus pedicellate flowers, caespitose versus rhizomatous growth, glabrous versus tomentose surfaces, and spinose versus serrulate leaves, among other morphological aspects. As a result, eight species have been recently described from complete herbarium material (staminate, pistillate, and fruiting specimens). These recent novelties include *H. perotensis* I. Ramírez & Mart.-Correa and *H. nuusaviorum* Espejo & López-Ferr. (Espejo-Serna et al., 2007), *H. pretiosa* Espejo & López-Ferr. and *H. zamudioi* Espejo, López-Ferr. & I. Ramírez (Espejo-Serna et al., 2008), *H. lepidophylla* I. Ramírez (Ramírez, 2008), *H. caulescens* López-Ferr., Espejo & Mart.-Correa (López-Ferrari et al., 2009), and *H. chichinautzensis* Mart.-Correa, Espejo & López-Ferr. and *H. colossa* Mart.-Correa, Espejo & López-Ferr. (Martínez et al., 2010). As a continuation of these studies, we propose here an additional new species from the state of Chihuahua in northern Mexico.

***Hechtia edulis*** I. Ramírez, Espejo & López-Ferr., sp. nov. TYPE: Mexico. Chihuahua: Mpio. de Batopilas, 13 km antes de llegar a Batopilas, viniendo de La Bufa, 27°06'28"N, 107°40'18"W, 695 m, talud en selva baja caducifolia, florecida en cultivo en junio 2007, I. Ramírez & G. Carnevali 1527 (holotype, CICY [♀]; isotypes, MO [♀], UAMIZ [♀]). Figures 1, 2.

Haec species a congeneris habitu caespitoso monocarpico, foliorum rosulis parvis, inflorescentiis staminatis pistillatisque magnitudine colore formaque similibus, paniculis semel ramificantibus ramis brevissimis, bracteis floralibus scariosis, floribus sessilibus atque florum pistillatorum petalis viridibus carnosus distinguitur.

Herbs dioecious, monocarpic, rupicolous, with caespitose, globular, small rosettes, ca. 25–40 cm diam., inflorescence emerging from the center of a fully developed rosette, new rosettes forming at the axils of the leaves or usually at the scape bases, thus the inflorescence appears lateral, but it is actually central. Leaves forming a mounded rosette; foliar sheaths ca. 1.2 × 2 cm, oblong, margins dentate, thin, white lepidote on both surfaces; foliar blades succulent, narrowly triangular, 14–20 × 0.9–1.2 cm, glabrous and shiny adaxially, white lepidote abaxially, apex acute, pungent, becoming revolute on external blades, erect on internal blades, margins strongly serrate, spines 1.5–2 mm, 5–6 mm apart, antrorse, retrorse, or forming a 90° angle with the foliar margin. Inflorescences a terminal, erect, once-

branched panicle in both sexes, up to 4× longer than rosette height, to 60–70 cm. Staminate inflorescences with an erect peduncle, 90–100 cm, terete in cross section, 3–4 mm diam., glabrous; scape bracts similar to leaves in shape, texture, and spines, 6.5–8 × 0.9–1 cm, much longer than internodes; internodes 2.5–3.5 cm; peduncle bracts narrowly triangular, acute to long acuminate, 3–6(–9) × 0.8–1 cm, slightly shorter or longer than internodes, densely white lepidote on both surfaces, margins serrate; rachis slightly sinuose, the internodes 1.5–5 cm, decreasing in length toward the apex, branches 11 to 17 per inflorescence, ascending at an acute angle with the rachis, the upper branches forming a 90° angle, (1–)3–7 cm, without sterile portion, (2 to)15 to 20 flowers per inflorescence branch; primary bracts much shorter than these secondary axes, decreasing in size acropetally, but generally 1/4 the length of the branch, ample, widely triangular, acute and long acuminate, 15–20 × 7–8 mm, apex pungent, strongly nervate when dry, margins serrate, drying light brown (color on fresh material not known). Flowers ca. 11 × 3 mm (diam.), sessile; floral bract oblong in general shape, asymmetric, apex acute, 3–3.5 × 3.8–4 mm, margins irregularly serrate, thin, generally 3-nerved, color when fresh unknown, drying light brown, cucullate; corolla open, campanulate; sepals basally connate to petals by ca. 1 mm, ovate, obtuse, 3–3.5 × 2.2–2.3 mm, 3-nerved, apex slightly dentate, margins sinuose, erose; petals widely elliptic, obtuse, apically cucullate, 4.5–5 × 3.4–3.5 mm, margins irregular, 7- to 9-nervate, very thin in texture, 3 of the stamens adnate to the petals and the other 3 free, filaments ca. 3.8 mm, 1-nervate, wider at the base, anthers basifixed, ca. 1 mm, base hastate; pistillode ovoid, ca. 3 × 1.5 mm (diam.), stigmatic lobes reduced, shorter than 0.5 mm. Pistillate inflorescences 51–80 cm high, much longer than rosette height; scape bracts narrowly triangular, long acuminate, apex pungent, 7.5–8(–13) × 0.4–0.6 cm, margins strongly serrate, spines antrorse or retrorse, abaxial surface densely white lepidote, scarcely white lepidote adaxially, with tuft of hairs on spines and along the margins; peduncle erect, terete in cross section, (7–)9–10(–17) cm × 4–5 mm (diam.), internodes 2–2.5(–3.5) cm; peduncle bracts narrowly triangular, acute and short acuminate, apex pungent, adnate to the scape, 2–4(–6.5) × 0.5–0.7 cm, margins serrate, white lepidote on both surfaces, shorter, equaling or longer than internode length; rachis slightly sinuose, 44–90 cm × 3–4 mm (diam. at base), decreasing to 1 mm at the apex, smooth, green, drying light brown; internodes 1.5–4 cm, becoming shorter acropetally; branches ascending,

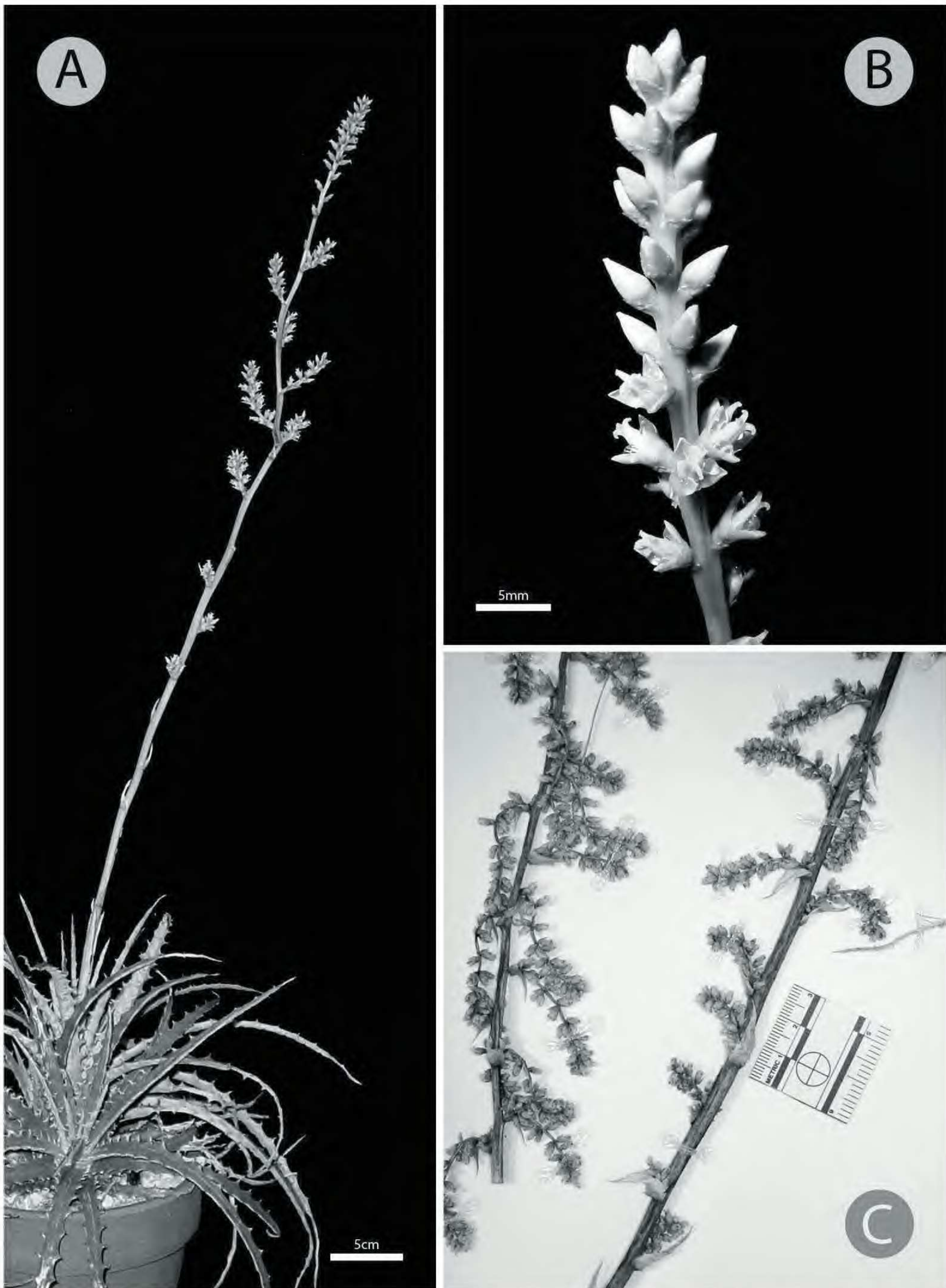


Figure 1. *Hechtia edulis* I. Ramírez, Espejo & López-Ferr. —A. Pistillate plant in bloom. —B. Pistillate branch. —C. Staminate branches. A, B from the holotype I. Ramírez & G. Carnevali 1527 (CICY); C from the paratype R. Bye 8855 (TEX). Photographs by Ivón M. Ramírez M.

forming an acute angle with the inflorescence rachis, branches (2–)4–6 cm, dense, 10 to 16 branches per inflorescence, 10 to 18 flowers per branch, some branches toward the inflorescence apex reduced to

one flower; primary bracts variable in shape and size, triangular, asymmetric, acute and long acuminate, 1–1.5 × 0.5–0.8 cm, much longer than the sterile portion of the branch, margins sinuose, finely and

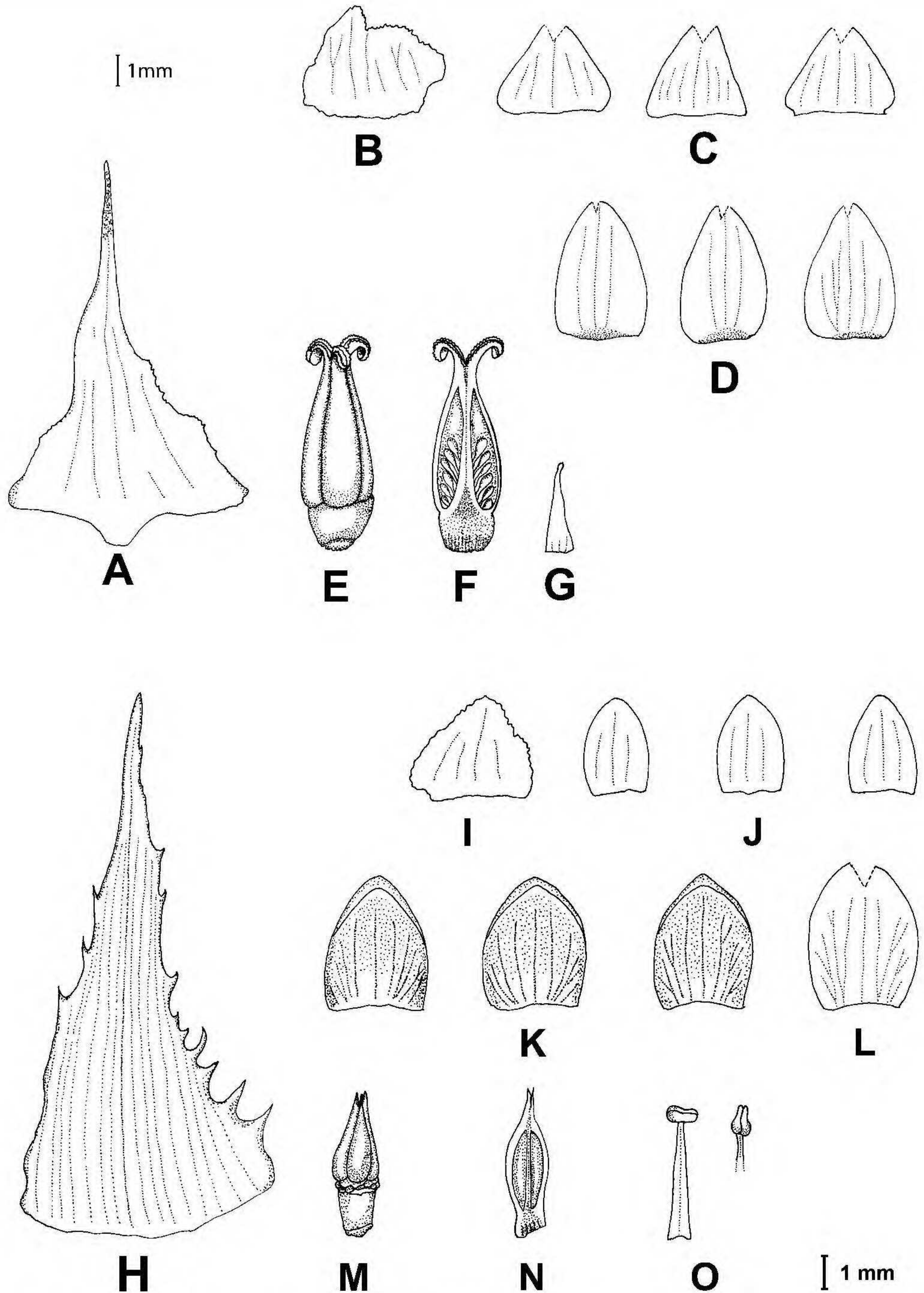


Figure 2. *Hechtia edulis* I. Ramírez, Espejo & López-Ferr. A–G. Floral dissection, pistillate structures. —A. Primary bract. —B. Floral bract. —C. Sepals. —D. Petals. —E. Ovary. —F. Longitudinal section of the ovary. —G. Staminode. H–O. Floral dissection, staminate structures. —H. Primary bract. —I. Floral bract. —J. Sepals. —K. Petals. —L. Petal with apical portion flattened. —M. Pistillode. —N. Longitudinal section of pistillode. —O. Androecium, with detail of anther apex at right. A–G based on the paratype, *I. Ramírez et al.* 1326 (CICY); H–O based on the paratype *R. Bye* 8855 (TEX).

irregularly erose at base, conspicuously 5-nerved, apex finely lepidote, brown and dry when flowers in anthesis, drying light brown. Flowers ca.  $5 \times 3$  mm (diam.), almost sessile, peduncle conic, thick, ca. 1–1.5 mm, green; floral bracts rectangular in overall shape, but variable among flowers in the same branch and inflorescence, asymmetric, margins irregular, somewhat erose, apical portion unequal, the longest portion 3–3.5 mm long, the shortest ca.  $2.5 \times 2.8$  mm, nerves variable in number and position, sometimes a central one with 2 lateral ones, these bifurcating, sometimes 3 nerves on one side of the central nerve; sepals free, widely triangular, margins slightly erose,  $2\text{--}2.5 \times 3\text{--}3.2$  mm, obtuse, fleshy, green basally, apically light brown and dry in anthesis, adnate to petals during anthesis, nerves variable in number, 5 to 7, sometimes lateral nerves bifurcating apically; petals free, widely elliptic to ovate,  $4\text{--}4.5 \times 2.8\text{--}3$  mm, apex acute, concave, green, fleshy, 3- to 5-nerved, sometimes 1 or 2 lateral nerves bifurcating, variable; staminodes narrowly triangular, elongated, 2.5–3 mm, acute, very thin, white; ovary superior, ovoid,  $4\text{--}5 \times \text{ca. } 2.3$  mm (diam.), green, the placentation central, ovules orthotropous, white, 0.5–0.7 mm; stigmatic lobes ca. 1 mm, revolute, margins glandular, yellowish. Capsules ovoid,  $7\text{--}10 \times 2\text{--}3$  mm (diam.), dark brown, sepals, petals, and stigmatic lobes persistent; seeds not seen.

*Distribution and habitat.* *Hechtia edulis* has been collected in Copper Canyon National Park, in Barranca de Batopilas and Barranca de Candameña, two of 20 canyons that are located in southwestern Chihuahua State in the Sierra Madre Occidental. There are ca. 40 bromeliaceous records for 10 out of 67 municipalities in the state of Chihuahua (Espejo-Serna et al., 2004), indicating a lack of information on plant diversity of this unexplored and inaccessible state. There are only two genera of the Bromeliaceae (*Pitcairnia* L'Hér. and *Tillandsia* L.), with one and eight species, respectively, reported for the area; *H. edulis* is the first record of the genus for the state. Individuals of this species grow as lithophytes on exposed, sheer cliffs in low caducifolious forest and oak-pine forest, forming small colonies of one to four rosettes.

*IUCN Red List category.* *Hechtia edulis* is only known from three localities from the same area. Much of the area is still unexplored, and therefore it is possible that larger populations exist. The species is subject to anthropogenic pressure (leaves are eaten raw by the native Tarahumara people in the region); however, based on this inadequate information, we

assess its conservation status as Data Deficient (DD), according to IUCN Red List criteria (IUCN, 2008).

*Phenology and reproductive biology.* We first became aware of the existence of this species during our study of Robert Bye's collections (4474 and 8855) during a stay at the Missouri Botanical Garden in the summer of 2004. Both vouchers featured staminate plants. A year later, a collecting trip was planned to obtain complete material of both sexes in Barranca de Batopilas during September 2005. We were successful in finding the populations; the plants, however, only carried old, open fruits. We collected a few rosettes and were eventually able to flower pistillate plants under cultivation and prepared the specimens cited here. This species blooms from June to August and fruits immediately after, with the fruits dehiscing seeds until the next year, probably more so during the beginning of the rainy season. Fruiting percentage appears to be 100%, as in many other species in the genus, with pollination most likely by bees based on color and shape of the corolla.

*Etymology.* The specific epithet refers to the fact that the leaves of *Hechtia edulis* are eaten by the Tarahumara people (fide Bye 8855).

*Discussion.* *Hechtia edulis* is peculiar among species in the genus because its staminate and pistillate inflorescences and flowers are extremely similar in size and shape, an unusual feature in this genus where staminate and pistillate inflorescences and flowers may greatly differ. As for many taxa in the genus, the affinities of the new species are unknown. Among other features, the size and shape of the rosettes place it in a group of species displaying small rosettes such as *H. marnier-lapostollei* L. B. Sm. and *H. lyman-smithii* Burt-Utley & Utley. This last taxon also presents similarities between inflorescence structures and dimensions among sexes, although these are variable within the population (Burt-Utley & Utley, 1987).

The new species is monocarpic, which distinguishes it from the polycarpic species in the genus that tend to grow and form large colonies of large rosettes. The pistillate inflorescence takes a long time to develop (approximately a month, pers. obs.), but all flowers reach anthesis over a two- or three-day interval. The pistillate inflorescence is short for the genus, only to 80 cm, and the flowers resemble those of *Hechtia stenopetala* and *H. perotensis*, species also featuring sessile flowers, dry scarious floral bracts and sepals (even in anthesal flowers), whitish or greenish, short, succulent petals, and a comparatively large ovary with thick stigma lobes. Nevertheless, *H. edulis* differs from both of these species by its smaller

rosettes, with leaves only to 20 cm long, when compared with the larger rosettes, with leaves ca. 50–100 cm long, of *H. stenopetala* from Veracruz and *H. perotensis* from Puebla and Veracruz in Mexico.

**Ethnobotany.** Robert Bye collected staminate plants in 1973 and 1978 and mentioned that the “crisp leaves eaten raw all year around” and “spines removed from succulent leaves and leaves eaten” by the Tarahumara people, one of the most important ethnic groups in the Sierra Madre Occidental that extend across the states of Chihuahua, southwestern Durango, and Sonora. The Tarahumaran name for the plant is “chikana,” and it is considered a member of the class “me” or “meke” (the agave) (fide R. Bye, in sched.).

**Paratypes.** MEXICO. **Chihuahua:** Mpio. de Batopilas, along La Bufa–Quirare rd. on N side of Barranca de Batopilas, 5500 ft., 26 Aug. 1978, R. A. Bye 8855 (CM [♂], TEX [♂]); S of Quirare, on N side of Barranca de Batopilas, 5000–6000 ft., oak forest in open area, 2 Aug. 1973, R. A. Bye 4474 (ECON [♂]); 13 km antes de llegar a Batopilas, viniendo de La Bufa, 27°06'28"N, 107°40'18"W, 695 m, 8 Sep. 2005, I. Ramírez, A. Espejo, A. R. López-Ferrari, A. Mendoza R. & J. Ceja 1326 (CICY [fr.]), A. Espejo, A. R. López-Ferrari, J. Ceja, A. Mendoza R. & I. Ramírez M. 6836 (UAMIZ [fr.]); same locality, flowering in cultivation in Mérida, Yucatán, 1 June 2009, I. Ramírez & G. Carnevali 1618 (IEB [♀], K [♀], MEXU [♀], NMC [♀], NY [♀], SEL [♀], TEX [♀], W [♀], XAL [♀]); Mpio. Ocampo, Parque Nacional Cascada de Basaseachic, 28°31'11"N, 108°12'30"W, 1570 m, in the barranca at the base of the falls, on rock at the base of dry S-facing cliffs, rather dry pine and oak woods, 4 Oct. 1986, R. Spellenberg, R. Soreng, R. Corral & T. Lebgue 8832 (MEXU [fr.], NMC).

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